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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/659,006	09/09/2003	Christopher H. Bajorek	004085.P030X	3505

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Daniel E. Ovanezian
BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP
Seventh Floor
12400 Wilshire Boulevard
Los Angeles, CA 90025-1026

EXAMINER	
DANIELS, MATTHEW J	
ART UNIT	**PAPER NUMBER**
1732	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	01/24/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/659,006	BAJOREK, CHRISTOPHER H.	
	Examiner	Art Unit	
	Matthew J. Daniels	1732	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 October 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-16,18,19 and 21-24* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-16,18,19 and 21-24* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☒ Other: *See Continuation Sheet*.

Continuation of Attachment(s) 6). Other: Duplicate copies of information disclosure statements (PTO-1449) filed 9/9/03, 10/8/03, 1/13/06, 12/1/03, and 12/11/03.

DETAILED ACTION

Information Disclosure Statement

1. The image file for this application shows the scanned information disclosure statements with the Examiner's digital signature. However, a duplicate copy is included with this action.

Double Patenting/Terminal Disclaimer

2. The terminal disclaimer filed on 23 October 2006 disclaiming the terminal portion of any patent granted on this application which would extend beyond the expiration date of any patent granted on Application number 10/757795 has been reviewed and is accepted. The terminal disclaimer has been recorded.

3. The rejections on the ground of nonstatutory obviousness-type double patenting set forth previously are withdrawn in view of the terminal disclaimer.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. Rejections set forth previously under this section are withdrawn in view of the amendments or arguments on page 9 of the remarks.

5. **Claims 1-16 and 22-24** are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Two embodiments are disclosed in [0038] (pages 10-11) of the specification. In one embodiment, the system is cooled and then the stamper is separated from the film. Alternatively, the stamper is separated from the film, and then cooled after separation. The new limitation of separating "before there is any *substantial* cooling of the resist film" (emphasis added) does not appear to have any support in the disclosure because it appears to claim that some cooling can occur, so long as it is not "substantial". In particular, the remarks at the top of page 12 of the reply appear to indicate that "substantial cooling" should be interpreted to be any degree of cooling between the initial temperature of the stamper/resist and the glass transition temperature. Paragraph [0038] does not appear to describe the claimed embodiment in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Claim Rejections - 35 USC § 102

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. **Claims 1, 2, 8, 11, 12, and 22** rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Davis (2002/0025408). **As to Claim 1**, anticipation of the claim depends on the interpretation of the claimed "before there is any substantial cooling of the resist film". Davis teaches a method comprising:

heating a stamper and a resist film ([0073] and [0074]);

imprinting the stamper into the resist film ([0076]);

separating the stamper from the resist film ([0076]);

cooling the resist film after separating (inherent in that other operations are subsequently performed).

Davis does not explicitly teach "separating the stamper from the resist film before there is any substantial cooling of the resist film". However, this limitation is anticipated or prima facie obvious over Davis' teachings regarding the mold and resist temperatures.

Regarding the mold, Davis teaches that the mold temperature can be above the glass transition temperature of the material to be embossed ([0073], lines 8-10), preferably within 30C above the glass transition temperature ([0073], lines 10-13), and most preferably within about 10C above the glass transition temperature ([0073]), line 14. Furthermore, by *maintaining* the mold slightly above the glass transition temperature and separately heating the substrate to greater than the glass transition temperature, the embossing cycle time can be reduced by orders of magnitude ([0078]).

Regarding the resist, Davis teaches that the substrate is heated to a temperature between about 5C or less above the glass transition temperature for crystalline material, and greater than about 5C above the glass transition temperature for amorphous materials ([0073]). Furthermore, Davis teaches that the substrate can be *maintained* or changed as necessary to enable substrate release ([0075], lines 3-7).

Because the mold is maintained within about 10C above the glass transition temperature and the resist is at a temperature substantially similar to the glass transition temperature (5C or

less above the Tg if crystalline, more than 5C above the Tg if amorphous, [0074]), there would not be any substantial cooling of the resist film before separation. However, in the alternative, Davis teaches that the particular temperatures of both the mold and resist represent result-effective variables that should be optimized in order to (1) optimize replication, (2) enable substrate release from the mold, and (3) maintain the integrity of the surface features. Thus, the temperatures of both mold and resist represent result effective variables that should be optimized. See MPEP 2144.05 II and *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). **As to Claim 2**, see [0073], [0077], [0074], [0078]. **As to Claim 8**, see [0077]. **As to Claims 11 and 12**, see [0073] and [0074]. **As to Claim 22**, see [0053]).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. **Claims 3-6** are rejected under 35 U.S.C. 103(a) as being unpatentable over Davis (2002/0025408) in view of Chou (USPN 5956216). Davis teaches the subject matter of Claims 1 and 17 above under 35 USC 102(b), or in the alternative under 35 USC 103(a). **As to Claim 3**, Davis appears to be silent to the trenches and plateau areas, but Chou teaches trenches and plateaus (Fig. 8). It would have been prima facie obvious to one of ordinary skill in the art at the time of the invention to incorporate the method of Chou into that of Davis a) in order to provide a magnetic material adapted for horizontal recording (4:54-64), and b) in order to to provide a

plurality of discrete elements of magnetic material, and c) because Davis clearly suggests the magnetic materials and method which Chou provides (Davis, par. [0080]). **As to Claim 4**, Chou teaches a substrate (Item 40, Figs. 4A-4D). **As to Claims 5 and 6**, Chou teaches selectively removing the resist film to form a pattern of areas that do not have the resist film thereon (Fig. 4C), and disposing a magnetic layer in the areas that do not have the resist film (Fig. 4D, Item 48).

8. **Claim 10** is rejected under 35 U.S.C. 103(a) as being unpatentable over Davis (2002/0025408). Davis teaches the subject matter of Claim 1 above under 35 USC 102(b), or in the alternative, under 35 USC 103(a). **As to Claim 10**, Davis appears to teach that the mold is maintained at its temperature, and thus would appear to be heated first. See [0078] in particular. However, the claimed order of heating represents a rearrangement in the order of steps, which is generally considered to be prima facie obvious in the absence of unexpected results. Here, it would have been prima facie obvious to rearrange the order of steps in order to perform a procuring temperature on the resist ([0066]-[0070]) and to subsequently imprint the preheated resist.

9. **Claim 7** is rejected under 35 U.S.C. 103(a) as being unpatentable over Davis (2002/0025408) in view of Chou (USPN 5956216), and further in view of Chou (USPN 6309580). Davis and Chou ('216) teach the subject matter of Claim 5 above under 35 USC 103(a). **As to Claim 7**, Davis and Chou ('216) appear to be silent to the deliberate etching of the base structure using the patterned resist film. However, Chou ('580) teaches that recesses may

be formed in the substrate (Fig. 8 and 10:41-51) using a patterned resist film produced by imprinting (Figs. 1A-1D). It would have been prima facie obvious to one of ordinary skill in the art at the time of the invention to incorporate the method of Chou ('580) into that of Davis because Davis suggests application of material into the spaces between the resist, and because doing so would mechanically secure the deposited material into the substrate, rather than to the surface.

10. **Claim 9** is rejected under 35 U.S.C. 103(a) as being unpatentable over Davis (2002/0025408) in view Faircloth (J. Vac. Sci. Technol. B, Vol. 18, Num. 4, Jul/Aug 2000). Davis teaches the subject matter of Claim 1 above under 35 USC 102(b), or in the alternative, under 35 USC 103(a). **As to Claim 9,** Davis appears to be silent to the multilayer resist. However, Faircloth teaches that bilayer resists are conventional in nanoimprint lithography (see the entire document). It would have been prima facie obvious to one of ordinary skill in the art at the time of the invention to incorporate the method of Faircloth into that of Davis because single layer resists are known to be problematic, and because doing so would provide higher resolution arrays of particles, lines, and crosshatches (Faircloth, right column).

11. **Claims 13-16** are rejected under 35 U.S.C. 103(a) as being unpatentable over Davis (2002/0025408). Davis teaches the subject matter of Claim 12 above under 35 USC 102(b). **As to Claim 13**, Davis does not explicitly teach the "close proximity", however, it would have been prima facie obvious to keep the stamper in close proximity to the resist film in order to avoid heat loss during transfer. **As to Claim 14**, Davis appears to be silent to the exact temperatures.

However, firstly Davis clearly recognizes that the particular temperatures of the stamper and resist represent result effective variables that the ordinary artisan would have optimized ([0073] and [0074]). See MPEP 2144.05 II and *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). Additionally, Davis suggests that the substrate (and resist) be heated to about 5 C above the glass transition temperature, and that the stamper should be within about 30 C over the glass transition temperature ([0073] and [0075]). **As to Claim 15**, Davis clearly teaches the resist and mold both be heated to a temperature very close to or at the glass transition temperature. **As to Claim 16**, Davis also teaches an embodiment wherein the resist is at a temperature slightly above the glass transition temperature, and the stamper is slightly below the temperature of the resist ([0073] and [0075]).

12. **Claim 21** is rejected under 35 U.S.C. 103(a) as being unpatentable over Davis (2002/0025408) in view Faircloth (J. Vac. Sci. Technol. B, Vol. 18, Num. 4, Jul/Aug 2000). **As to Claim 21**, Davis teaches a method comprising:

heating a stamper and a resist film to a first temperature at least that of a transition temperature of the resist film ([0073] and [0074]);

imprinting the stamper into the resist film ([0076]);

cooling the resist film to a second temperature above room temperature ([0076] and [0078]);

separating the stamper from the resist film ([0076]).

Davis teaches that the particular temperatures of both the mold and resist represent result-effective variables that should be optimized in order to (1) optimize replication, (2) enable

substrate release from the mold, and (3) maintain the integrity of the surface features. Thus, the temperatures of both mold and resist represent result effective variables that should be optimized. See MPEP 2144.05 II and *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). In particular, Davis teaches that this could be accomplished by cooling the resist to any temperature below the glass transition temperature (which would be above room temperature), meeting the claimed temperature limitations.

Davis appears to be silent to the multilayer resist. However, Faircloth teaches that bilayer resists are conventional in nanoimprint lithography (see the entire document). It would have been prima facie obvious to one of ordinary skill in the art at the time of the invention to incorporate the method of Faircloth into that of Davis for the following reasons:

(1) because single layer resists are known to be problematic (Faircloth, page 1, right column).

(2) because doing so would provide higher resolution arrays of particles, lines, and crosshatches.

(3) in order to provide layers having distinct characteristics, such as different etching characteristics (Faircloth, page 3, right column).

(4) Davis clearly does suggest vapor deposition of metals ([0080]) and other magnetic materials onto the formed surface of the polymer material. Faircloth provides a bilayer resist which enhances the ability to descum the bottom of the trenches (page 3, right column), which would be desirable prior to vapor deposition of metals,

13. **Claims 18 and 19** are rejected under 35 U.S.C. 103(a) as being unpatentable over Davis (2002/0025408) in view Faircloth (J. Vac. Sci. Technol. B, Vol. 18, Num. 4, Jul/Aug 2000), and further in view of Chou (USPN 5956216). Davis and Faircloth teach the subject matter of Claim 21 above under 35 USC 103(a). **As to Claim 18**, Davis appears to be silent to disposing the resist film above a base structure prior to heating, the base structure comprising a substrate. However, Chou teaches a substrate (Item 40, Figs. 4A-4D). It would have been prima facie obvious to one of ordinary skill in the art at the time of the invention to incorporate the method of Chou into that of Davis because Davis clearly suggests a variety of coatings ([0064] and [0067]). **As to Claim 19**, Davis appears to be silent to the claimed limitations. However, Chou teaches selectively etching the resist film to form areas above the base that do not have the resist film thereon (Fig. 4C) and disposing a magnetic layer above the base layer in the areas that do not have the resist film (Fig. 4D). It would have been prima facie obvious to one of ordinary skill in the art at the time of the invention to incorporate the method of Chou into that of Davis because Davis clearly suggests the method for magnetic media ([0052]).

14. **Claims 23 and 24** are rejected under 35 U.S.C. 103(a) as being unpatentable over Davis (2002/0025408) in view of Chou (USPN 5956216), Chou (USPN 6309580), and Chen (USPN 4786564). Davis, Chou ('216), and Chou ('580) teach the subject matter of Claim 7 above under 35 USC 103(a). **As to Claim 23**, Chou ('580) teaches removing the resist film (10:3-24) wherein a pattern of raised zones and recessed zones is formed in the base structure, but Davis, Chou ('216) and Chou ('580) appear to be silent to a continuous layer. However, Chen teaches a continuous layer which is provided as protection for the underlying alloy (7:67-8:7). It would

have been prima facie obvious to one of ordinary skill in the art at the time of the invention to incorporate the method of Chen into that of Davis in order to provide a hard layer to protect the delicate magnetic structure. **As to Claim 24**, Davis teaches a thermoset resist ([0053]).

Response to Arguments

15. Applicant's arguments filed 23 October 2006 have been fully considered but they are not persuasive. The arguments appear to be on the following grounds:

a) Applicant respectfully submits that the Examiner's reading of paragraph [0075] of Davis is inapposite. (Page 11, beginning at line 2) "The applicant asserts that paragraph [0075] of Davis discloses that the substrate is placed in the mold (first sentence), the substrate temperature is modified as necessary to emboss the mold (second sentence), and finally the substrate is cooled before removing it from the mold to ensure surface integrity (third sentence). (Davis, page 8, paragraph [0075])."

b) Davis discloses that typically the mold and the substrate are to be cooled to a temperature below the glass transition temperature before removal. The Examiner interpreted this statement to mean that in some instances cooling does not occur prior to removal. The Applicant asserts that this is an incorrect reading of Davis.

c) Faircloth discloses that single layer resists are problematic when transferring a pattern via metal liftoff. Davis does not disclose transferring patterns, and therefore there is no motivation for the combination.

16. These arguments are not persuasive for the following reasons:

a and b) Firstly, (Page 11, beginning at line 2) "The applicant asserts that paragraph [0075] of Davis discloses that the substrate is placed in the mold (first sentence), the substrate temperature is modified as necessary to emboss the mold (second sentence), and finally the substrate is cooled before removing it from the mold to ensure surface integrity (third sentence). (Davis, page 8, paragraph [0075])."

In response, the Examiner asserts (1) that the substrate temperature is not necessarily modified, but may be instead *maintained*, and (2) that the second sentence pertains also to the temperature at removal. Davis teaches that the temperature can be "maintained...as necessary in order to optimize replication and enable substrate release from the mold while maintaining the integrity of the surface features." (emphasis added, second sentence of [0075]). Maintaining the integrity of the surface features occurs at removal (third sentence of [0075]). Thus, the Examiner asserts that the second sentence pertains also to the removal step, and in at least one embodiment, the temperature is maintained while removing from the mold.

However, in the alternative, the Examiner asserts that Davis clearly teaches temperature throughout the process to be a result effective variable that should be optimized in order to maintain the integrity of the surface features.

Note also the teachings and explanation provided above under the rejection of Claim 1. Davis teaches that both the mold temperature and resist temperature are above the glass transition temperature (also see [0073]-[0078]).

c) The recited motivation is still believed to be valid. Davis clearly does suggest vapor deposition of metals ([0080]) and other magnetic materials onto the formed surface of the

polymer material. Faircloth provides a bilayer resist which enhances the ability to descum the bottom of the trenches (page 3, right column), which would be desirable prior to vapor deposition of metals, it is asserted that the motivation and combination are valid.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew J. Daniels whose telephone number is (571) 272-2450. The examiner can normally be reached on Monday - Friday, 8:00 am - 4:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Christina Johnson can be reached on (571) 272-1176. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

MJD 1/20/07

CHRISTINA JOHNSON
SUPERVISORY PATENT EXAMINER
1/22/07